of long or short period) in the egg production of a single individual bird, owing to the fact that the production is in discrete units. Yet while the end products of ovarian activity are discrete units there are very strong reasons for supposing that physiologically the elaboration—or production in the broad sense—of eggs by the ovary is a continuous process. This matter has been rather fully discussed in a former paper from this laboratory.[3] Evidence of another sort for the continuity (in the mathematical sense) of ovarian activity has recently been given by Gerhartz[4] in a valuable paper on metabolism in the fowl.

2. By a simple statistical expedient it is possible to represent the changes in rate of fecundity in an individual bird as a continuous curve, of which the ordinates represent the rates of egg production on a percentage scale (0 to 100) at the time intervals plotted as abscissæ. This is done by taking, as the rate of fecundity for any given day p_n, the percentage which the actual number of eggs laid by the bird during the 21 days of which p_n is the central day, is of 21. Put as a formula, if

R_{p_n} = rate of fecundity (or ovarian activity as indicated by ovulation) on the day p_n,

1 = an egg produced,

and Σ denotes summation between the indicated limits, we have

$$R_{p_n} = \frac{100\,(\sum_{p_{n-10}}^{p_{n+10}} 1)}{21}.$$

The rates so calculated for each successive day may be plotted as a curve.

3. The reasons why 21 days are chosen as the basis of the calculation rather than some other odd number of days will be fully discussed in the complete paper. Here it need only be said that there are good biological grounds for this choice. Gerhartz[5] has shown, for example, that this number represents about the average number of oocytes to which any appreciable addition of yolk is being made at any given instant of time.

4. Applying this method to records of one, two and three year old hens many interesting and novel points regarding ovarian activity, as expressed in ovulation, may be made out. The long period secular cycles of production appear much more clearly and precisely than in flock mass statistics. The steady diminution in maximum rate of fecundity per unit of time after the first spring cycle in the bird's life is very strikingly shown in the great majority of cases.

This method of measuring fecundity opens the way to the attacking *in the individual* of a number of problems which hitherto have only been amenable to indirect, statistical treatment. Such, for example, are the questions of relation of size of egg to rate of fecundity, the relation between fertility (in the fowl readily measured by hatching quality of eggs) and fecundity. There are many other interesting biological problems relating to reproduction in birds, the analysis of which will certainly be aided by the method here discussed.

The complete paper describing the method and illustrating it fully by examples will shortly be published elsewhere.

RAYMOND PEARL

[3] *Cf.* Pearl and Surface, *loc. cit.*

[4] Gerhartz, H., "Ueber die zum Aufbau der Eizelle notwendige Energie (Transformationsenergie)," *Pflüger's Arch.*, Bd. 156, pp. 1–224, 1914.

[5] *Loc. cit.*

THE NORTH CAROLINA ACADEMY OF SCIENCE

THE North Carolina Academy of Science met in its thirteenth annual session at Trinity College, Durham, on Friday and Saturday, May 1 and 2, 1914, with 28 members in attendance. The executive committee held a meeting in the early afternoon of Friday, and this was followed by a general meeting for the reading of papers. At night, after Dean W. I. Cranford had welcomed the academy to Trinity College, President Franklin Sherman, Jr., of the academy, read his presidential address, "The Animal Life of North Carolina with some Suggestion for a Biological Survey." Following this, Professor A. H. Patterson gave a lecture on "The Gyroscope and its Modern Applications" with demonstrations of some fine apparatus. Next Mr. Bert Cunningham gave a striking demonstration of the new nitrogen tungsten lamp, comparing its light efficiency with that of

ordinary tungsten and carbon lamps consuming the same amount of current. At the conclusion of the session the faculty of Trinity College gave a smoker complimentary to the members of the academy.

The annual business meeting was held at 9 A.M. on Saturday, May 2. Reports of the executive and other committees and of the secretary-treasurer were read. An invitation for the academy to meet at Wake Forest College in 1915 was accepted. A committee was appointed to formulate and present recommendations to the next legislature for a statute regulating the ventilation of public buildings in the state. A resolution was passed endorsing President Sherman's suggestions concerning a biological survey of the state. Four new members were elected. These with present enrollment of 64 give a total of 68 members.

The following officers were elected for the ensuing year:

President—J. J. Wolfe, Trinity College, Durham.

Vice-president—A. H. Patterson, University of North Carolina, Chapel Hill.

Secretary-Treasurer—E. W. Gudger, State Normal College, Greensboro.

Additional Members Executive Committee—W. N. Hutt, State Department of Agriculture, Raleigh; J. H. Pratt, State Geological Survey, Chapel Hill; W. A. Withers, North Carolina Agricultural Experiment Station, West Raleigh.

At 9:45 the reading of papers was resumed and continued until 12:30 when the program was finished. The total attendance was 30 out of a membership of 68. The number of papers on the program was 30, of which only two were read by title. Marked features of the meeting were the considerable number of papers read and the discussions participated in by a large number of those present. Including the presidential address, which was published in full in the May number of the *Journal of the Elisha Mitchell Scientific Society*, the following papers were presented:

Presidential address—Studies of the Animal Life of North Carolina with Suggestions for a Biological Survey: F. SHERMAN, JR.

The first questions asked when any animal or plant arouses interest have to do with its identity, distribution, seasonal activities and economic relations, hence the need of biologists supplying this information in some form available for reference. Very little accurate information on these points can be obtained from the public itself, it must be threshed out by careful work on the part of the biologists. Many cases can be cited showing that forms formerly believed to be harmless are really important, as shown by discoveries in medical entomology, hence our studies should include all forms of life. Such studies should not only include the listing of species, but also the mapping out of their distribution, and the seasons of their occurrence and activities.

In this work in North Carolina, considerable progress has been made in the study of the larger marine invertebrates, chiefly at the government Biological Laboratory at Beaufort. Land invertebrates exclusive of insects have been little studied. In the insects, considerable progress has been made in many groups, especially the order Orthoptera, parts of the order Hemiptera, dragon-flies in the Neuroptera, butterflies and larger moths in the Lepidoptera, several families in the Diptera, a large number of records in Coleoptera though only a good start, and very little in the Hymenoptera.

In the vertebrates, the fish fauna is already well presented in "Fishes of North Carolina," much data has been accumulated regarding the batrachians and reptiles, a volume on the birds is now in course of preparation, and the mammals, on the whole, are fairly well known.

What has thus far been accomplished, has been largely out of fondness for the subject, and quite incidental to other duties, the data has been gathered from publications and specimens collected by many persons both within the state and from outside, and it is hoped that the biologists in the state will attempt to complete, compile and publish these records in appropriate volumes until the fauna of the state shall be definitely placed on record. Botanists are urged to undertake the same for the flora.

Such studies would supplement and strengthen the work of morphologists, and would aid the study of such directly economic problems as the life-histories of insects, spread of weeds and fungous diseases, efficiency of birds in control of pests, etc.

Economic Geology of Chapel Hill, N. C. and Vicinity: JOHN E. SMITH.

GENERALIZED SECTION OF MANTLE ROCK

	Thickness, Ft.
1. Soil, "top soil," red to gray or black...	1 to 3
2. Subsoil, fine, somewhat compact, red to yellow clay	3 to 10

3. Clay, coarse and lumpy, with some sand. 5 to 20
4. "Natural sand-clay," feldspar, quartz, sand and clay .....10 to 20
5. Fragmental rock, angular, decayed, size 2 to 4 in. .....10 to 20
6. Fragmental rock, coarser and fresher than that in 5 ..... 5 to 15
7. Granite, "bed rock," "country rock."

This region serves as a type for Piedmont areas in which granite is the underlying rock—about one third of the Piedmont Belt.

Zone No. 1 is the surface soil of the upland and is used in agriculture and in road building. No. 2 provides clay suitable for brick and tile. As the topography is mature and these zones have been removed by erosion from much of the area, the value of the land is low. The material of zone 4 makes good sand-clay roads. This is approximately horizontal and outcrops on the slopes where valleys have been cut below its depth. Stream sand is used in making mortar and in road construction.

This mantle rock forms an excellent filter and most wells in it are free from contamination. Excepting the mountain region, these are the most healthful areas in the south.

An Achlya of Hybrid Origin: W. C. COKER.

An *Achlya* was described from Chapel Hill, N. C., with peculiarities that suggest a hybrid origin. The tips of the hyphae often die and the growth is then extended as a side branch below the dead tip. The spores show a strong tendency to poor organization, the protoplasm often segregating only imperfectly, and producing irregular masses of various sizes. The same is true of the eggs, which are of any size and almost never become perfectly organized, and die quickly. The plant seems most like *Achlya polyandra* Hildeband, but differs from it in the walls of the oogonia being pitted and in the abnormal behavior of the eggs.

It is suggested that the plant may be a hybrid between *A. DeBaryana* Humphrey and *A. apiculata* DeBary.

The Nurse Sharks of Boca Grande Cay, Florida: E. W. GUDGER.

Boca Grande Cay is an island of coral sand and mangroves lying about 20 miles west of Key West. Situated on a shallow submarine platform, about 120° of its circumference is surrounded by sand flats inhabited largely by sting rays. Another 120° of its circumference is bounded by a shallow, gently sloping, rock bottom on which the water a half mile from shore will not be over a man's shoulders. On this rocky bottom, the nurse sharks, *Ginglymostoma cirratum,* come out to bask in the sun, to play, to breed, and possibly to feed. Here they are found in large numbers. A dozen can be seen at almost any time, and thirty-three have been counted in the sweep of the eye.

These sharks in looks and habits much remind one of well-fed pigs in a barnyard. They are much broader in the pectoral region than ordinary sharks, are sluggish in their movements, and are comparatively unafraid of man. They frequently lie in water so shallow that their dorsals project above the surface, and a number of times they allowed the boat to drift down over them and strike their fins before they would move.

They lie with heads on each others pectorals or tails, or one will have his snout elevated on another's flank, or they will lie heads and tails together or in a confused herd. Here again this similarity of habits to barnyard pigs is very noticeable. Further they often swim one after another to the number of three or four in an aimless fashion, each one following the purposeless turnings of its leader.

They are perfectly harmless. Their mouths are small and filled with small pointed teeth. They are omnivorous in feeding like most sharks, but their food seems chiefly to be crustacean, probably consisting of the large spiny "crawfish" common on the reef and on rocky bottom of any kind.

Under the circumstances noted above, there is, of course, no difficulty in killing these sharks. Ordinarily shark fishing is good sport, but killing nurse sharks is no more exciting than sticking pigs in a barnyard. Indeed the Key West fishermen contemptuously speak of them as "Nurses," and of the other sharks as "sharks."

Work on the habits and embryology of this shark is being carried on under the auspices of the Marine Laboratory of the Carnegie Institution of Washington situated at Tortugas and will be continued this summer.

Flowers and Seed Development of Specularia perfoliata: H. R. TOTTEN AND J. A. MCKAY.

There are two kinds of flowers, conspicuous open ones with normal corollas and small bud-like flowers that never open. The last or cleistogamic flowers were described carefully by von Mohl, as long ago as 1863.

It is the object of this paper to give the development of the seeds in the cleistogamic flowers. The seeds are of the same size and appearance as those borne in the open flowers. Four megaspores are

formed and the embryo-sac develops from the lower one. It is surrounded by a single nucellar layer and one thick integument. The endosperm nucleus forms a cellular endosperm from the first division. The young endosperm sends out a knob-like haustorium of one or two cells at each end. The suspensor of the embryo grows up into the micropylar haustorium, to some extent, forming a small enlarged knob there. As the seed grows the haustoria are encroached upon and destroyed.

Studies in the Toxicity of Cottonseed Meal: W. A. WITHERS, R. S. CURTIS AND G. A. ROBERTS.

About one hundred and seventy-five hogs were fed upon cottonseed meal or some fraction of it. The swine died in every case after eating the meal for periods ranging on average from 59 to 96 days. Twenty-two rabbits fed on cottonseed meal died on average of 13 days.

With different solvents used, the extract was usually non-toxic and the residue usually toxic.

Green feed, liberal exercise and ashes seemed to be of some aid to pigs in overcoming the toxic effect of cottonseed meal. Treatment of the meal with an alcoholic alkali rendered the meal non-toxic to rabbits.

Citrate of iron and ammonia was effective with rabbits and ferrous sulphate was effective with swine as an antidote to the toxicity of cottonseed meal.

The Locust Tree Carpenter Moth, a Formidable Parasite of the Oak: J. J. WOLFE.

In February, 1911, a white oak about fourteen inches in diameter, on the campus of Trinity College was seen to be severely injured as a result of the boring habits of what proved to be the larvæ of *Pryonoxystus robiniæ,* commonly known as the locust tree carpenter moth. The tree was cut and sections of the trunk split into two pieces. Numerous winding tunnels were found throughout the heart and sap wood of the trunk and larger limbs. From these were collected fourteen larvæ of three distinct sizes—a fact supporting the view that the insect requires three years for its development. A portion of the trunk near the ground was riddled with holes—points of exit—in which wood-destroying fungi had established themselves and threatened the destruction of the tree.

The insect attacks several trees of the street, park and forest. Its habits render it a formidable pest. Means for its control on any large scale are at present wanting, but sporadic occurrences in trees of streets and parks might possibly be held in check by injecting into these tunnels a volatile poison and then plugging them with some waxy substance.

The Pecan Twig Girdler: C. L. METCALF.

A detailed account of the egg-laying habits of *Oncideres cingulata* Say; the preliminary and supplementary maneuvers habitually performed (which result in the severing of numerous twigs from the tree in which the eggs are laid); with a brief account of the life-history, economic importance and methods of control of the pest in commercial pecan orchards.

Some Rare Plants and Singular Distributions in North Carolina: W. C. COKER.

Announcement was made of the addition of a new tree to the flora of North Carolina. The pin oak (*Quercus palustris* DuRoi) was found near Chapel Hill by Mr. J. S. Holmes, state forester, in the fall of 1913.

Rhododendron catawbiense Michx., supposed to be confined in this state to the tops of the highest mountains, was reported as growing at Chapel Hill, Hillsboro, and other places in Orange county, and stranger still at Cary (near Raleigh), and even at Selma which is well into the coastal plain.

Venus' fly trap (*Dionœa muscipula* Ellis). Evidence as to distribution of this remarkable plant was reviewed and it was concluded that this species is distributed from Buckville, S. C., to New Bern, N. C., and westward along the Cape Fear River to Fayetteville.

The tuberous variety of tall meadow oat grass (*Arrhenatherum elatius* (L.) Beauv., var. *bulbosum*) was exhibited from Chapel Hill. This is a recent introduction from Europe where it is known as a troublesome weed. Within the last three years the U. S. Department of Agriculture has received it occasionally from Virginia to Georgia.

Blessed thistle (*Cnicus benedictus* L.) was shown to be a troublesome weed in Chapel Hill grain fields.

Euonymus atropurpureus Jacq. This is found to be one of the rarest shrubs in North Carolina, and known with certainty only from Chapel Hill.

The Lawn Problem in the South: W. C. COKER AND E. O. RANDOLPH.

This paper attempts to find some way of solving the hard problem of lawn-making in the South. Observations were made on many lawns, with various conditions of soil, exposure and care, to determine the grasses and weeds actually present. About six of the most promising grasses were carefully studied to determine their value and use as lawn cover.

Exhibits were made in trays of good sods formed by these six grasses, and also of some of the worst lawn weeds.

A Rough Method of Recording Seasonal Distribution: C. S. BRIMLEY.

The method I am about to describe is not meant to take the place of full records or complete data with regard to any group of living things in which one is particularly interested, but rather to provide a convenient means of summarizing such records and also to record data concerning animals or plants in which one is less interested and therefore is not likely to take much trouble about.

The method is briefly this: rule the left-hand pages of a blank book into 12 vertical columns, leaving enough space on the left for the names of the species to be recorded, and leaving the right-hand page blank for any additional data. At the head of these twelve columns write the abbreviations, Jan., Feb., Mar., Apl., May, Jun., Jly., Aug., Sep., Oct., Nov., Dec., and when you have a record to make of a species, record it by the appropriate letter of the month in the column for that month, J standing for early January, a for middle January, n for late January and so on, early signifying from the first to 10th inclusive, middle for from 11th to 20th, late from 21st to end of month.

I have used this method very largely for recording the seasonal range of insects and give some examples below:

	Jan.	Feb.	Mar.	Apl.	May	Jun.	Jly.	Aug.	Sep.	Oct.	Nov.	Dec.
Syrphids:												
Eristalis tenax.....		F.	Mar.	Apl.	May	Jun.	Jly.			Oct.	Nov.	Dec.
Eristalis transversa....			r.	Apl.	May	Jun.	J y.		ep.	Oct.	Nov.	Dec.
Milesia ornata.....						Jun.	ly.	Aug.	e.	Oct.	N.	
Hawk Moths:												
Protoparce sexta.....						un.	Jly.	Aug.	Sep.			
Hemaris thysbe.....			r.	Apl.	M	un.	Jly.	Au.	e.			
Ceratomia undulosa....				pl.	May	Jun.	Jly.					
Plant Bugs:												
Brochymena 4-pustulata	Jan.	Feb.	Mar.	Apl.	May	Jun.	Jly.		e.	Oct.	Nov.	Dec.
Murgantia histrionica..			Mar.	Apl.	May	Jun.	Jly.	Aug.	Sep.	Oct.	Nov	
Euschistius servus.....	Jan.			Apl.	May	Jun.	Jly.	Aug.	Sep.	Oct.		
Euschistius tristigmus..			Mar.	Apl.	May	Jun.	Jly.			Oct.	Nov.	

I have hundreds of species of insects recorded in this way and records are both easy of access and very serviceable when one wishes to find at what period of the year any particular insect is likely to occur. Of course separate records could be kept for each year and should of course be kept for different localities, but as a matter of course such a system would necessarily come into use mainly for the locality in which one spends the greater part of one's time.

E. W. GUDGER,
Secretary

No abstracts have been received for the following papers:

"Movements of Plants," by J. D. Ives.

"A Report on Local Protozoa," by Z. P. Metcalf.

"By Raft and Portage: A Study in Early Transportation in North Carolina," by Collier Cobb.

"The Case of the Riparian Owner," by R. N. Wilson.

"Some Philippine Sponges," by H. V. Wilson.

"Economic Minerals in the Pegmatite Dikes of Western North Carolina," by J. H. Pratt.

"The Sclerotinia Disease of Clovers and Alfalfa," by H. R. Fulton.

"The Use of Home-made Models as an Aid in Teaching Embryology," by W. C. George.

"Electrical Conduction of Flowing Mercury," by V. L. Chrisler, presented by A. H. Patterson.

"Microscopic Demonstration of Protozoan Spores, Used as Proof of Contamination of Food with Human Excrement," by C. W. Stiles.

"Some Recent Developments in the Theory of X-rays," by C. W. Edwards.

"The Coggins Gold Mine," by J. H. Pratt.

"The Gyroscope and its Modern Applications" (with a demonstration), by A. H. Patterson.

"Geology in Relation to the Location of Highways in North Carolina," by Collier Cobb.

"The Corn Bill Bug," by Z. P. Metcalf.

"A Peculiar Case of Freezing," by R. N. Wilson.

"The Nitrogen Tungsten Lamp," by Bert Cunningham.